Corporate Tax Avoidance and Debt Costs*

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Abstract

We use path analysis to investigate how corporate tax avoidance is priced in bond yields and bank loan spreads. We find that approximately one half of the total effect of tax avoidance on bond yields is explained through the negative effect of tax avoidance on future pre-tax cash flow levels and volatility and, to a lesser extent, lower information quality. The effects of these mediating variables are much less pronounced for bank loan spreads. The results of additional cross-sectional analyses indicate that, relative to bond investors, banks are able to reduce information asymmetry problems more effectively, given their access to firms' private information and greater ability to monitor borrowers.

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1. Introduction

Prior evidence indicates that bank loan spreads and public bond offering yields are increasing in corporate tax avoidance, with the economic effects being substantially larger in bonds than bank loans (Hasan, Hoi, Wu, and Zhang, 2014). However, the literature has not investigated the channels through which borrowers' tax avoidance activities influence the spreads of their newly-issued debt. We examine the importance of the paths through which corporate tax avoidance affects bond yields and bank loan spreads and provide additional cross-sectional analyses on firm characteristics that likely affect the relationship between corporate tax avoidance on bond yields.

We consider two paths through which tax avoidance could be positively associated with bond yields and loan spreads. First, corporate tax avoidance activities could induce higher uncertainty about the magnitude and volatility of the firms' future cash flows, which is viewed negatively by lenders.[1] This future cash flow uncertainty due to tax avoidance comes about because of an increased probability of IRS audits, penalties, and interest charges, and also because of managerial rent extraction. Firm managers can use complex tax structures to enable and obscure the expropriation of firm resources (e.g., Desai, Dyck, and Zingales 2007; Dhaliwal, Huang, Moser, and Periera 2011; Hanlon, Hoopes, and Shroff 2014).

Second, corporate tax avoidance activities contribute to a decrease in the quality and transparency of the financial statements. Desai and Dharmapala (2006) and Desai et al. (2007) argue that tax avoidance, especially when it involves more aggressive positions, often results in opaque reporting. Similarly, Balakrishnan, Blouin, and Guay (2018) find that tax-avoiding firms are characterized by a less transparent external information environment due to these activities' role in increasing the complexity of the firm. Given that lenders rely on firm

[1] The classical Merton (1974) model suggests that debt investors demand compensation for exposure to total asset volatility risk, which is affected by both systematic and unsystematic risk factors. Corporate tax avoidance is likely to affect asset volatility through its impact on the firm's cash flows.

disclosures to estimate default risk as well as the rate of recovery if default occurs, they are likely to view negatively more opaque financial statements. This argument particularly applies to bond investors who can only access public disclosures.

Our empirical tests use a sample of 7,945 individual bonds issued by 1,035 U.S. domiciled non-financial firms over the period 1990-2007 and 6,015 bank loans obtained by 1,297 firms over the same time period. We employ a number of proxies to capture corporate tax avoidance. Our first measure, *CETR5*, is the ratio of taxes paid in cash to pre-tax income net of total special items averaged over a five-year period just prior to the bond issue or bank loan origination (Dyreng, Hanlon, and Maydew 2008).[2] Our second measure, *TA_CASH5*, is the firm's *CETR5* less the mean of the year-industry-size *CETR5* (Balakrishnan, Blouin, and Guay 2018). Lower values of these first two measures indicate more aggressive tax avoidance. Our third and final measure, *CV_CETR5*, is the coefficient of variation of the cash ETR estimated over the same 5-year period as *CETR5* (McGuire, Neuman, Olson, and Omer 2016). Higher values of *CV_CETR5* indicate more and riskier tax avoidance. These latter two measures extend the Hasan et al. (2014) results to examine tax avoidance at the riskier end of the spectrum, which is more likely to affect lenders' assessments of borrowers' credit risk.

Using all firms on Compustat (other than financials and utilities) that have available data, regardless of whether they issued bonds or obtained bank loans in the current year, we document that firms engaging in corporate tax avoidance activities experience significant pre-tax cash flow shortfalls and greater pre-tax cash flow volatility over the next five years. We also find that corporate tax avoidance predicts, to a lesser extent, lower information quality. The ability of the tax avoidance measures to predict lower pre-tax cash flow levels and higher pre-tax cash flow volatility as well as higher information opacity confirms that these three

[2] Hasan et al. (2014) use the Manzon and Plesko (2002) book-tax difference measure, which is the U.S. portion of total book tax differences, the Frank, Lynch, and Rego (2009) adjusted permanent book tax differences, and a cash effective tax rate, all estimated on an annual basis. We have replicated our results using yearly effective tax rate measures, and our inferences are similar.

variables could serve as channels or paths through which tax avoidance may lead to higher debt spreads.

We next employ a path analysis to assess the mechanism through which corporate tax avoidance potentially increases the cost of bonds and bank loans.[3] For both the bond and loan samples, we find, consistent with results for the Compustat sample, that the three mediating variables (future cash flow levels, future cash flow volatility, and future information opacity) are all significantly associated with tax avoidance in the predicted directions: more tax avoidance is associated with lower future pre-tax cash flow levels, higher future pre-tax cash flow volatility, and lower information quality. These associations are a necessary condition for the variables to play a mediating role.

We also document that corporate tax avoidance has a significant direct effect on debt spreads in both bond and loan samples. Therefore, even after including the mediating variables in the regression of tax avoidance on bond yields and loan spreads, the estimated coefficient on the tax avoidance variable is still significant, with the significance on each tax avoidance variable being similar across both bonds and loans, suggesting that the mediating variables do not fully explain the association between tax avoidance and debt spreads.

Finally, we document that all three mediating variables are generally significant in the predicted directions when added to the regression of bond yields and loan spreads on each tax avoidance measure. The standardized coefficients and significance levels are higher in the bond sample, consistent with the interpretation that these mediating variables play a larger role for bonds than for bank loans. We find that approximately one half of the total effect of tax avoidance on bond yields is explained through the negative effect of tax avoidance on future pre-tax cash flow levels and volatility and, to a lesser extent, lower information quality.

[3] We use a path analysis to answer *how* a variable, X, affects another variable, Y, through a third mediating variable, Z. In contrast, we use an interaction analysis to answer *when* a moderating variable impacts the magnitude (i.e., moderates) the relation between X and Y. The moderating variable is not affected by X. Baron and Kenny (1986) provide a discussion on mediation versus moderation.

In our last set of analyses, we further investigate the role of two sets of firm characteristics that potentially affect the association between corporate tax avoidance and debt spreads: (1) lender wealth expropriation incentives, which reflect conflicts of interest between equity-holders and lenders, and (2) the probability of an IRS audit, which reflects an alternative monitoring source that reduces lender risk but also increases tax risk. We capture lenders' wealth expropriation incentives using four empirical constructs: the presence of strong antitakeover provisions, the presence of large blockholders, high managerial equity incentives, and high credit risk.

Overall, our findings indicate that corporate tax avoidance increases the cost of bond financing but not bank financing when managers have incentives to expropriate lenders' wealth and firms face a high probability of an IRS audit. These results suggest that, relative to bond investors, banks are better able to reduce information asymmetry problems and effectively monitor borrowers' activities, given banks' better access to private information.

Our paper makes a number of contributions to the prior literature. First, we provide new evidence on how tax avoidance affects public debt yields and bank loans spreads, thus explaining the mechanism driving the results in Hasan et al. (2014), who document a positive association between tax avoidance and the cost of debt. We document that tax avoidance predicts reduced future pre-tax cash flow levels, increased future pre-tax cash flow volatility, and lower future information quality, and that tax avoidance influences bond yields and bank loan spreads through these mediating variables. In addition, our analyses rely on two new measures of tax avoidance that likely better capture more-risky tax planning and also show that bond yields (but not loan spreads) are larger in firms with high lender expropriation incentives and IRS audit probability, highlighting important information frictions in bond markets.

Second, we add to the rapidly developing literature that investigates the impact of reported financial information and its quality on the cost of debt securities (e.g., Yu 2005;

Francis, LaFond, Olsson, and Schipper 2005; Sengupta 1998; Bharat, Sunder, and Sunder 2008; Easton, Monahan, and Vasvari 2009; Ghosh and Moon 2010; Shivakumar, Urcan, Vasvari, and Zhang 2011; DeFond and Zhang 2014). We show that measures of corporate tax activities inferred from the firm's reported income statement are relevant variables that are priced in public and private debt markets not because of their impact on the quality of the accounting information but because they are a leading indicator of future cash flow problems.

Third, our results provide an additional explanation on why more firms do not engage in tax shelters and corporate tax avoidance, given the possibility of substantial tax savings (e.g., Weisbach 2002). Our evidence suggests that major providers of capital—public debtholders—view corporate tax avoidance in a negative light, especially when incentives to expropriate their wealth are in place and the probability of an IRS audit is high, consistent with Graham and Tucker (2006) and Wilson (2009), who document a strong negative relation between leverage and the incidence of tax shelter activity. In addition, given the results in Goh, Lee, Lim, and Shevlin (2016), who show that the cost of equity is lower for tax-avoiding firms, our findings further support the negative association between leverage and corporate tax avoidance by showing that tax avoidance makes borrowing more expensive relative to equity, thus incentivizing the firms to borrow less.

The remainder of the paper is organized as follows. Section 2 develops our hypotheses and summarizes the prior literature. Section 3 discusses the sample selection, variables and the research design. Section 4 presents our findings, and Section 5 concludes.

2. Prior literature and predictions

2.1 Prior literature

Hasan et al. (2014) document that both bank loan spreads and public bond issuance yields are increasing in corporate tax avoidance. They argue that, while corporate tax savings increase current period after-tax cash flows, thus lowering default risk, lenders might perceive

increased risks associated with tax avoidance activities and demand higher loan spreads and bond yields. The perceived increased risks could arise from increased information risks (Desai and Dharmapala 2006; Kim, et al. 2011; Balakrishnan, et al. 2018), lower and possibly more volatile future cash flows arising through increased agency risks (Desai and Dharmapala 2006; 2009; Chen, Chen, Cheng, and Shevlin 2010; Chyz, Leung, Li, and Rui 2013), and increased IRS audit risk (Mills 1998; Mills and Sansing 2000; Wilson 2009). Two somewhat related papers examine the relation between corporate bond ratings and book-tax differences (BTDs, both temporary and total). Crabtree and Maher (2009) find that firms in the extreme quintiles of BTDs (defined on an industry-year basis) are rated as riskier by rating agencies. Ayers, Laplante, and McGuire (2010) also examine the same general research question by looking at changes in corporate bond ratings as a function of changes in book-tax differences. However, neither of these papers investigates the mechanisms (uncertainty of future pre-tax cash flows versus information quality) through which corporate tax avoidance activities affect bond yields and loan spreads.

2.2 Path analysis predictions

There are several possible mechanisms through which corporate tax avoidance might lead to the documented higher bond yields and bank loan spreads in the prior literature. First, corporate tax avoidance activities, particularly the more aggressive ones, could reduce future pre-tax cash flows and increase future pre-tax cash flow volatility due to tax risks. These risks come about because of higher probability of IRS audits, interest, and penalties. For example, Wilson (2009) reports that, among his sample of tax shelter participants, the median savings from the tax shelters is $66.5 million, with the IRS assessing interest and penalties on the tax shelters of $58 million. Complex tax structures can also allow firm managers (and others) to expropriate firm resources (i.e., extract managerial rents), which may or may not include the cash tax savings from the tax-avoidance activity (e.g., Dhaliwal et al., 2011). Such wealth

expropriation reduces the after-tax cash flows to lenders and increases the volatility of future cash flows. Both lower levels and more volatile cash flows will lead lenders to require ex ante price protection via higher bond yields and loan spreads.

Second, in the spirit of Scholes et al. (2014), there are non-tax costs associated with corporate tax avoidance activities, such as lower quality and transparency of the financial statement numbers that potentially impair lenders' ability to monitor the borrowers. Desai and Dharmapala (2006) and Desai, et al. (2007) argue that aggressive tax avoidance often leads to opaque financial reporting that conceals either the purpose of the underlying transaction or the very existence of the transaction to escape detection by tax authorities. In the same spirit, Frank, et al. (2009) document that tax aggressiveness is associated with the reporting of more discretionary accruals, while Kim, Li, and Zhang (2011) find that corporate tax avoidance activities are strongly associated with firm-specific stock price crash risk, consistent with the opacity introduced by tax avoidance facilitating the hoarding and accumulation of bad news for extended periods.[4]

Finally, Balakrishnan et al. (2018) document that tax avoidance activities result in less transparent information because these activities increase the complexity of the firm. Therefore, if corporate tax avoidance increases the opacity of financial information, lenders will face higher adverse selection and moral hazard problems that should be reflected in higher bond offering yields and bank loan spreads. However, because banks have exclusive relationships with borrowers through prior lending, cash management, or advisory activities, they have access to private information and therefore are less exposed to these agency problems (e.g., Leland and Pyle, 1977; Diamond, 1984). Further, Gallemore. Gipper, and Maydew (2019) provide evidence on banks' role as tax planning advisors. Thus, banks gain access to more

[4] A recent line of research argues that firms with aggressive financial reporting are less likely to be tax aggressive to avoid the suspicion of investors, SEC, or IRS (e.g., Erickson, Hanlon, and Maydew 2004; Lennox, Lisowsky, and Pittman 2013).

private information about firms' tax planning activities and gain better insights on the potential outcomes of these activities. Additionally, if banks actually help design tax plans, they will presumably do so with their own interests in mind. These arguments suggest that borrowers' poor information quality due to tax avoidance activities will have a lower impact on bank loan spreads.

2.3 Cross-sectional predictions

Similar to Hasan et al. (2014), we argue that the relationship between corporate tax avoidance and debt spreads is affected by firm characteristics that are ex ante proxies for the increased credit risks triggered by corporate tax avoidance. Because these firm variables are not directly impacted by firm-specific tax avoidance activities, we view them as moderating variables and make cross-sectional predictions.

First, we focus on four variables that capture the extent to which shareholders and managers have incentives to expropriate lenders' wealth: (1) The presence of strong antitakeover provisions, (2) the presence of large blockholders, (3) high CEO equity risk-taking incentives, (4) high credit risk. We expect the positive association between bond yields/bank loan spreads and tax avoidance to be stronger if indeed these measures capture borrowers' incentives to expropriate lenders' wealth. Strong antitakeover provisions, coded using the methodology of Gompers, Ishi, and Metrick (2003), are an indication of poor governance because they shield the firm from the market for corporate control, which is viewed as a strong external disciplining mechanism.[5] Ineffective monitoring by the corporate takeover market could allow entrenched managers to exploit tax avoidance activities for personal gains (Desai and Dharmapala 2006). However, the adoption of antitakeover amendments is not necessarily a sign of lender wealth expropriation. Avoiding takeovers that are motivated by wealth

[5] We acknowledge the likely endogeneity of the corporate takeover index. For example, a growing firm with large needs for outside debt financing has more incentives to adopt better governance practices in order to lower its cost of debt.

transfers from lenders to stockholders (Shleifer and Summers 1988) or increasing the credit risk of the firm by adding debt or bank loans (Warga and Welch 1993) while preserving cash through corporate tax avoidance schemes can be beneficial to lenders.

The presence of large blockholders is viewed negatively by lenders, because these shareholders have both the incentive and ability to expropriate resources (e.g., Lisowsky et al. 2011). Tax avoidance activities, particularly the more aggressive ones, offer large blockholders an opportunity for expropriation (e.g., Desai and Dharmapala 2006; Desai et al. 2007). An alternative argument can be made for the role of blockholders as outside monitors of the management of the firm (Jensen 1993; Shleifer and Vishny 1997). These shareholders have the incentives (due to the large size of their investment) and resources to uncover managerial opportunism that also negatively affects lenders' wealth.

Regarding high CEO equity incentives, Coles, Daniel, and Naveen (2006) document that a higher sensitivity of a CEO's wealth to stock volatility (i.e., vega) is associated with riskier policy choices (more investment in R&D; less investment in property, plant, and equipment; more focus on fewer lines of business; and higher leverage). All of these activities are detrimental to lenders' wealth because they increase the riskiness of the underlying assets and facilitate wealth expropriation. In addition, Rego and Wilson (2012) document a positive association between vega and corporate tax avoidance. However, another effect of increased vega is to expose managers to more risk. If CEOs are undiversified with respect to firm-specific wealth, they are exposed to more risk than diversified shareholders. Accordingly, CEOs may engage in less risky activities, which are beneficial to lenders.

When firms are credit risky (i.e., when they have speculative grade debt or bank loans), equity-holders have strong incentives to engage in risky activities that expropriate lenders' wealth due to their convex payoff function (Easton et al., 2009). This is because equity-holders hold a call option that is relatively close to being out-of-the-money vis-à-vis the call option

embedded in an investment grade bond or bank loan. As a result, high credit risk likely reflects incentives to expropriate lenders' wealth via asset substitution (selling less risky assets and investing in risky assets).

Second, we investigate the role of increased tax risk on the relationship between debt spreads and tax avoidance. Given that the IRS reduces the ability of managers to act opportunistically by employing tax-planning activities, it is likely protecting lenders' wealth. In support of this argument, Guedhami and Pittman (2008) find that the probability of an IRS audit decreases bond yields among private firms, suggesting that IRS monitoring plays a valuable monitoring role. Further, Hoopes, Mescall, and Pittman (2012) find that IRS audits deter corporate tax avoidance. These arguments suggest a weaker association between tax avoidance and bond yields and bank loan spreads when the probability of an IRS audit is higher. However, lenders could be concerned about the risks associated with an IRS audit of a firm's tax avoidance activities, because such an audit can trigger large payouts, introducing uncertainty about firms' future cash flows (Wilson 2009).

Similar to the arguments we provide for the path analysis, we expect that the moderating role of lender wealth expropriation incentives and high IRS risk on the relationship between tax avoidance and debt spreads to be more muted for loan spreads. Banks are effective monitors due to their concentrated ownership of the debt and requirements for very strict financial covenants that give banks control rights and facilitate frequent renegotiations of loan contracts (e.g., Dichev and Skinner, 2002; Roberts 2015).

3. Sample selection and variable definitions

In this section, we first present our bond and bank loan sample selection process and provide background information on the data sources to build our two samples. We then describe our main variables of interest: the cost of public debt (bond) financing and bank loan spreads,

and the tax avoidance measures. Finally, we discuss the research design and the set of bond and loan attributes and firm-specific characteristics used as controls in the multivariate tests.

3.1 Sample selection and descriptive statistics

For our bond sample, we start with the universe of bonds in the Mergent Fixed Income Securities Database (FISD) issued between 1990 and 2007. Our sample ends in 2007 because we need forward years of data for estimating uncertainty about future cash flows and information quality. FISD provides bond-specific information such as bond size, issue date, rating, coupon rate and frequency, and other features, as well as borrower-specific information. We eliminate bond issues that have missing ratings and bond-specific information; that have pay variable coupon payments (a minority in the database); that are convertible into common stock; that are not issued by firms incorporated in the United States; and that are privately placed under Rule 144A.[6]

We apply several additional filters to this initial dataset to obtain our final bond sample. First, we select all bonds for which the U.S. borrower could be manually matched to Compustat, based on company name and industry membership. Second, we exclude financial companies (i.e., those whose SIC code is between 6000 and 6999). These companies tend to issue a large number of bonds to finance their operations or off-balance sheet trusts they sponsor, and are highly regulated. Finally, we require bond issuers to have available data in Compustat for relevant firm-specific variables and the tax avoidance measures. Our final bond sample contains 7,945 individual bonds issued that cover 1,035 firms between 1990 and 2007.

For our bank loan sample, we use a sample of syndicated loans from DealScan, which contains data on syndicated loans at the time of their origination. For consistency with our bond sample, we collect data for bank loans issued by U.S. firms between 1990 and 2007. To ensure

[6] Rule 144A does not require bonds to be registered with the SEC. Thus, borrowers under Rule 144A might not provide U.S. GAAP financial statements. Further, these bonds are less liquid than public bond issues because they can be purchased by only a limited set of qualified financial institutions.

comparability, we remove loans with missing ratings and loan facilities with non-floating interest rates and apply the data filters we used to obtain the bond sample. Our final loan sample contains 6,015 individual loans that were issued by 1,297 firms between 1990 and 2007.

Table 1 presents and compares descriptive statistics for the bond sample and the bank loan sample. Firms obtaining bank loans are significantly smaller, are more profitable, and have higher market-to-book ratios consistent with growth firms using banks as their source of external debt because of information asymmetry issues around valuation and monitoring of firms. Consistent with the banks' role in mitigating information asymmetry and providing closer monitoring of borrowers, firms obtaining bank loans have a significantly lower percentage of assets in property plant and equipment (tangible assets), a higher percentage of intangible assets, more foreign income, a higher frequency of NOL carryforwards, and a higher volatility of pre-tax cash flows. Finally, consistent with Hasan et al. (2014), the average bank loan size is significantly larger than the average bond size.

3.2. Measures of tax avoidance

We use three measures of tax avoidance. Our first measure is the cash effective tax rate, computed as the ratio of total taxes paid in cash scaled by total pre-tax income net of total special items, each summed separately over the last five years prior to the bond issuance date (*CETR5).*[7] Summing over the five-year period reduces the effect of transitory fluctuations in cash taxes paid. This measure reflects both permanent and temporary book-tax differences. Examples of such tax planning are investments in tax havens with lower foreign tax rates, investments in tax exempt or tax-favored assets, and participation in tax shelters (e.g., Wilson 2009). By focusing on cash taxes paid, this measure avoids the overstatement of current tax expense due to the accounting for the income tax benefits of employee stock options

[7] Dyreng et al. (2008) argue that single-year ETR suffers from significant year-to-year variation and is a poor proxy of long-run tax avoidance.

during our pre-SFAS 123R sample period (see Hanlon and Shevlin 2003). We remove observations with negative total pre-tax income net of total special items over the last five years and truncate the measures to the range [0,1].

Our second measure is from Balakrishnan et al. (2018) and is intended to capture aggressive tax avoidance. Balakrishnan et al. argue that "other things equal, similar-sized firms in the same industry are expected to have similar tax planning opportunities. And, among firms with similar tax planning opportunities, firms with unusually low tax liabilities can be considered more tax aggressive" (p. 10). Thus, adapting their procedure, we adjust our firm-specific *CETR5* by the same time period mean industry-size *CETR5*. We sort firm size independently of industry and base industry on the Fama-French 48 industry classification. Specifically, we define *TA_CASH5* as *CETR5* less the mean year-industry-size *CETR5*. Negative values indicate the firm paid less taxes during that time period relative to other similar-size firms in that industry. In other words, the firm was more tax aggressive.

Our third measure is intended to capture risky tax avoidance activities. Following McGuire, et al. (2016), we calculate the coefficient of variation of the annual cash ETR over the same five-year period as the above two measures. Specifically, we calculate *CV_CETR5* as the standard deviation of the annual cash ETR divided by the mean of the annual cash ETRs. Higher values of *CV_CETR5* indicate more-risky tax avoidance activities. This measure, or variations of it, have been used in Nueman, McGuire, and Omer (2013), Guenther, Matsunaga, and Williams (2017), and Neuman, Omer, and Schmidt (2015).

Table 1 shows that the bank loan sample exhibits lower tax avoidance—higher *CETR5* and *TA_CASH5*—but higher volatility of cash-effective tax rates, consistent with a riskier tax planning activity.

3.3 Replication of Hasan et al. (2014)

Before implementing the path analysis, we first confirm the positive association between

tax avoidance, bond yields, and loan spreads, as documented by Hasan et al. (2014). We estimate the following OLS regression model:

$$Y_{i,t} = \propto_1 + \propto_2 Tax\ avoidance_{i,t-1} + \propto_3 Bond - Loan\ specific\ controls_{i,t} + \propto_4 Firm\ specific\ controls_{i,t-1} + \propto_5 Industry\ FE + \propto_6 Year\ FE + \varepsilon_{i,t} \quad (1)$$

The dependent variable, *Y*, is either offering bond yields or bank loan spreads. *Offering bond yield* is the yield to maturity of bonds computed at the time of issuance. *Bank loan spread* is the loan spread quoted in basis points over a floating benchmark (typically, the London Interbank Offered Rate). We use the logarithm of loan spreads in our empirical analysis to be consistent with Hasan et al. (2014). In Table 1, we report descriptive statistics on bond offering yields and bank loan spreads. The average bond-offering yield is 7.16%, whereas the average bank loan spread is 4.51%. *Tax avoidance* is one of the three tax avoidance proxies defined above.

We control for a number of bond-specific characteristics in our bond sample regressions. These variables are described in Table 1, and a discussion of them is included in Appendix 1. As reported in Table 1, the average rating of the bonds in our sample is 8.1, which is equivalent to a Standard and Poor's "BBB+" rating. Sample bonds have, on average, a time until maturity of about 12 years, and a face value of US$179 million. About 4% of the sample bonds are subordinated, 49% are callable, 2% are putable, and 3% have a sinking fund provision in place. These averages are similar to the characteristics of the average bond in the Mergent database, suggesting that our filters pick a relatively representative sample of bonds.

We also control for a number of loan-specific factors in our loan analyses, as listed in Table 1 and discussed in Appendix 1. The average rating of loans in our sample is about 10, translating into "BBB-" rating. Sample loans have, on average, a time until maturity of about four years and a face value of US$424 million. About 48% of loans include a performance

pricing provision, 74% are revolvers, 95% are senior debt instruments, and 31% are secured. The average loan includes 1.3 financial covenants, three general covenants, and is financed by 11 lenders.

We include several firm-specific controls that are discussed in Appendix 1. All models include year-fixed effects to capture structural changes in the debt markets' liquidity as well as general economic conditions over time. We also include industry-fixed effects (defined as per Fama and French 48 industry definitions) to mitigate industry related time-invariant factors that might drive our results. We control for autocorrelation in model errors by computing standard errors clustered at the firm level.

Table 2 presents results of our Hasan et al.'s (2014) replication analysis. The association between tax avoidance and bond yields (bank loan spreads) is in Panel A (Panel B). The table reports coefficient estimates from OLS regression models together with *t*-statistics (in parentheses). To conserve space, we do not tabulate the estimated coefficients on all the control variables included in each regression. For the bond sample, the explanatory power of our model (adjusted R^2) is relatively high at 79%, suggesting that the variables included are important drivers of bond-offering yields. We find a significant and negative association between the five-year cash ETR measure, *CETR5*, and the industry-size adjusted cash ETR, *TA_CASH5*, and bond offering yields, with a coefficient −0.567 (*t*-statistic = −3.30) and -0.618 (*t*-statistic = −3.22), respectively. We also find a significant positive association between the coefficient of variation in cash ETRs, *CV_CETR5*, and bond offering yields (coefficient = 0.143, t-statistic = 4.80), indicating yields are increasing in riskier tax avoidance.

For the bank loan sample, the explanatory power of our model (adjusted R^2) is also relatively high at 78%, again suggesting that our model captures the most important variables that drive loan spreads. We find a significant and negative association between the five-year cash ETR measure, *CETR5*, and the industry-size adjusted cash ETR, *TA_CASH5*, and *logarithm of* bank

loan spreads, with a coefficient −0.180 (*t*-statistic = −2.25) and -0.219 (*t*-statistic = −2.60), respectively. We also find a significant positive association between the coefficient of variation in cash ETRs, *CV_CETR5*, and bank loan spreads (coefficient of 0.040, t-statistic of 4.43), indicating spreads are increasing in riskier tax avoidance.[8] Overall, our results are consistent with Hasan et al. and indicate that corporate bondholders and bank lenders view corporate tax avoidance activities negatively and, as a result, the cost of bonds and bank loans is increasing in tax avoidance.

4. Path analyses

4.1 The impact of tax avoidance on future cash flow levels, cash flow volatility, and information quality

We investigate three possible paths through which tax avoidance could impact bond yields and loan spreads. Corporate tax avoidance activities could make future cash flows more uncertain due to tax risk or by facilitating managerial rent extraction that lowers future cash flow levels. Moreover, a third possible path is that tax-planning activities can result in a less transparent information environment due to these activities' role in increasing the complexity of the firm. We test directly the impact of corporate tax avoidance on these potential channels by estimating the following regression on a sample of all non-financial Compustat firms having necessary data over our sample period 1990-2007:[9]

[8] To mitigate the concern that the presence of large firms in the sample can affect our results, we reran the analyses after excluding the top 5% and 10% of total firm assets observations and found similar results. Hasan et al. (2014) use a firm-fixed effects model to control for omitted firm-specific, time-invariant factors. When we add firm-fixed effects, our results are qualitatively similar, with slightly smaller t-statistics, but each tax avoidance measure is still significant at least at the 5% level in both samples.

[9] We do not restrict the analysis here to the bond and loan samples, as we want to estimate the relations in a broad sample of firms.

$$Channel_{i,t\ to\ t+4}$$

$$= \propto_1 + \propto_2 Tax\ avoidance_{i,t-1} + \propto_3 Firm\ specific\ controls_{i,t-1} \quad (2)$$

$$+\propto_4 Industry\ FE + \propto_5 Year\ FE + \varepsilon_{i,t\ to\ t+4}$$

The dependent variable in equation (2) is either *Pre-tax cash flow level*, defined as the average of pre-tax cash flow from operations scaled by total assets over the next five years, *Pre-tax cash flow volatility*, defined as the coefficient of variation of pre-tax cash flow from operations scaled by total assets over the next five years, or *Information quality*.

Information quality is our composite measure of information quality. Prior research (Frank et al. 2009; Balakrishnan et al. 2018) documents that tax planning results in less transparent financial reporting and information environments. We construct a composite measure of *Information quality* using the following seven financial reporting/information quality proxies:

a) The ratio of annual research and development expense (coded as 0 if missing) to sales averaged over the next five years. R&D expense is used by prior research to proxy for the presence of intangible assets, which are associated with higher information asymmetry (Barth and Kasznik 1999; Barth, Kasznik, and McNichols 2001).

b) The accrual quality measure, calculated as the standard deviation of residuals over the next five years from an industry-year level Dechow and Dichev (2002) model, augmented with fundamental variables from the Jones model (McNichols 2002).

c) The performance-adjusted discretionary accruals, calculated from the Jones Model averaged over the next five years (Kothari, Leone, and Wasley 2005).

d) The absolute analyst forecast error (*AFE*), calculated as the absolute value of the difference between actual reported earnings and the latest IBES median consensus analyst forecast (reported immediately before the earnings announcement), scaled by the absolute

value of the latest IBES median consensus analyst forecast. To be consistent with other information quality proxies, we average *AFE* over the next five years.

e) The analyst forecast dispersion, calculated as standard deviation of the forecasts included in the latest IBES consensus forecast, scaled by the absolute value of the latest IBES median consensus forecast and averaged over the next five years.

f) The number of forecasts included in the latest IBES consensus analyst forecast and averaged over the next five years. We multiply this measure with -1 so that it captures a less transparent information environment.

g) The average monthly bid-ask spread, scaled by the average of the absolute value of bid and ask prices and calculated over the next five years.

We rank annually each of the seven information quality proxies above into deciles and standardize these deciles to be between 0 (high information quality) and 1 (low information quality). *Information quality* is the average of these seven standardized ranks.

We report the results of estimating equation (2) in Table 3. The dependent variable in columns 1-3 is *Pre-tax cash flow level*. We find that the two cash ETR measures exhibit significant positive coefficients: lower ETRs are associated with lower future pre-tax cash flows, and greater tax avoidance leads to lower future cash flows. Riskier tax avoidance, proxied by *CV_CETR5,* is significantly negatively associated with future pre-tax cash flows. A one-standard deviation increase in tax avoidance, as measured by *CETR5 (CV_CETR5),* decreases future pre-tax cash flow levels by 0.8% (0.5%); this is an economically large effect, given that the average *Pre-tax cash flow level* (untabulated) in this sample is 14% of total assets.

The dependent variable in columns 4-6 is *Pre-tax cash flows volatility*. Consistent with the conjecture that tax avoidance increases uncertainty in future cash flow levels, we find significant negative coefficients on our two cash ETR tax avoidance proxies, suggesting that tax avoidance also increases future cash flow volatility. Riskier tax avoidance, proxied by

CV_CETR5, is significantly positively associated with future pre-tax cash flow volatility. A one-standard deviation increase in tax avoidance, as measured by *CETR5* (*CV_CETR5*), decreases future pre-tax cash flow levels by 0.073 (0.077). This number is economically significant, given that the average *Pre-tax cash flows volatility* in our sample is 0.871.

Finally, the dependent variable in columns 7-9 is *Information quality*. We find significant and negative coefficients on our two cash ETR tax avoidance proxies, suggesting that tax avoidance is negatively associated with future information quality (recall information quality is scaled 0 high quality to 1 low quality). Riskier tax avoidance, proxied by *CV_CETR5*, is significantly positively associated with our information quality, consistent with riskier tax planning being associated with poorer future information quality. A one-standard deviation increase in tax avoidance, as measured by *CETR5* (*CV_CETR5*), decreases future information quality by 0.002 (0.009). However, this effect seems to be economically modest, given that the average *Information quality* in our sample is 0.433. The ability of the tax avoidance measures to predict lower future cash flow levels and higher cash flow volatility is consistent with the possibility that bond investors and bank lenders view tax avoidance behavior as an early indicator of problems in future cash flow levels and volatility, two variables that are first order determinants of a firm's cost of debt.

4.2 Path analysis results

While the above analysis suggests a relationship between tax avoidance and the cost of public debt and bank loan spreads through these three channels, it is silent on the importance of these channels. In particular, we cannot conclude whether the relationship between tax avoidance and the cost of bonds and bank loans is completely explained by, for example, the impact of tax avoidance on future pre-tax cash flows levels. The path analysis sheds more light on this issue.

Path analysis is a structural equation model used to decompose the correlation between two variables into a direct path and an indirect path through a mediating variable. In our paper, the path analysis decomposes the relationship between tax avoidance and the cost of debt into a direct path between these two variables and an indirect path through future cash flow levels, cash flow volatility, or information quality. The analysis automatically standardizes all variables in the model with a mean of zero and a standard deviation of one, allowing a comparison between direct and indirect path coefficients. We estimate the following model:

$$\begin{aligned} Y_{i,t} \;=\; & \propto_1 + \propto_2 \; Tax\ avoidance_{i,t-1} + \propto_3 \; Channel_{i,t\ to\ t+4} \\ & + \propto_4 \; Bond\ specific\ controls_{i,t} + \propto_5 \; Firm\ specific\ \ controls_{i,t-1} \\ & + \propto_6 Industry\ FE + \propto_7 Year\ FE + \; \varepsilon_{i,t} \end{aligned} \tag{3}$$

$$Channel_{i,t\ to\ t+4} \;=\; \beta_1 + \; \beta_2\, Tax\ avoidance_{i,t-1} \; + \; \epsilon_{i,t\ to\ t+4} \tag{4}$$

In the first equation, the dependent variable, *Y*, is either offering bond yields or bank loan spreads, as defined above, while in the second equation, the dependent variable, *Channel*, is either *Pre-tax cash flow level*, *Pre-tax cash flow volatility*, or *Information quality*. Appendix 2 presents a graphical illustration of the direct and indirect (mediated) paths. The path coefficient in equation (3), $\propto_2$, is the magnitude of the direct path from tax avoidance to the cost of bonds or bank loans, after including the mediating variables. As noted by Zhao et al. (2010), an insignificant $\propto_2$ coefficient is consistent with the mediating variables fully mediating the relation between tax avoidance and the cost of bonds or bank loans. We have no prediction as to whether our included mediating variables fully mediate the relation or not. The total magnitude of the indirect (mediated) path is given by the path coefficient $\beta_2 * \propto_{3,}$ where β_2 is an estimate of the association between tax avoidance and the mediating variable, and $\propto_3$ is the

association between the mediating variable and bond yield or loan spreads. The percentage of the total path explained by the mediated path is given by $(\beta_2 * \propto_3)/[\propto_2 + \beta_2 * \propto_3])$.

We report the path coefficients in Table 4 (bond sample) and Table 5 (bank loan sample).[10] For illustration purposes, the graphic in Appendix 2 includes the estimated coefficients of the model, using *CETR5* as the tax avoidance measure from Panel A Table 4. Panel A of Table 4 shows that after including future pre-tax cash flow level as the mediating variable, the direct path between bond yields and tax avoidance remains significantly negative for the two cash ETR measures and significantly positive for *CV_CETR5*. The indirect path coefficient, $\beta_{2,}$ for pre-tax cash flow level with the two cash ETR measures (*CV_ETR5*) is significantly positive (negative), suggesting that higher (riskier) tax avoidance results in lower future pre-tax cash flow levels (consistent with Table 3, where we use the larger Compustat sample). Moreover, the path coefficient between the pre-tax cash flow level and the offering yield, $\propto_3$, is negative and significant for the two cash ETR measures. The total mediated path, $\beta_2 * \propto_3$, is negative for the two cash ETR measures and positive for *CV_CETR5*. The percentage of the total path explained by the mediating variable, pre-tax cash flow level, is 37%, 52%, and 2% for *CETR5*, *TA_CASH5*, and *CV_CETR5*, respectively.

Panel B of Table 4 reports results for future pre-tax cash flows volatility as the mediating factor. Consistent with Panel A, the direct path between bond offering yields and tax avoidance is significant. When we look at the components of the mediated path, the indirect path coefficient between pre-tax cash flow volatility and the two cash ETR measures, (*CV_ETR5*) and $\beta_{2,}$ is significantly negative (positive), suggesting that higher (riskier) tax avoidance results in a higher future pre-tax cash flow volatility (again consistent with Table 3, which uses the larger Compustat sample). Moreover, as expected, the path coefficient between pre-tax cash

[10] We did not employ these three channels as mediating variables at the same time, because they are highly correlated (for example, the Spearman correlation between cash flows level and volatility is -57% in our sample).

flow volatility and the offering yield, $\propto_3$, is positive and significant for all three measures of tax avoidance. The total mediated path, $\beta_2 * \propto_3$, is negative for the two cash ETR measures and positive for *CV_CETR5*. The percentage of the total path explained by the mediating variable, pre-tax cash flow volatility, is 34%, 57%, and 6% for *CETR5*, *TA_CASH5*, and *CV_CETR5*, respectively, which are very similar to the percentages for the mediating variable pre-tax cash flow level.

Finally, Panel C of Table 4 reports results for information opacity as the mediating factor. Consistent with Panels A and B, the direct path between bond offering yields and tax avoidance continues to be significant. When we look at components of the indirect path, the path between the two ETR proxies and information quality, β_2, is only significantly negative for *TA_CASH5* and is significantly positive for *CV_CETR5*. On the other hand, as expected, the path between information quality and the bond offering yield, $\propto_3$, is positive and significant (recall that higher values of information quality denote lower information quality). The percentage of the total path explained by the mediating variable, information quality, is 0%, 22%, and 20% for *CETR5*, *TA_CASH5*, and *CV_CETR5*, respectively.

The path analysis for bank loan spreads is reported in Table 5. Panel A shows that after including future pre-tax cash flow level as the mediating variable, the direct path between bank loan spreads and tax avoidance, $\propto_2$, is still statistically significant. The indirect path coefficient between the pre-tax future cash flow level and the two cash ETR measures, (*CV_ETR5*) and β_2, is significantly positive (negative), suggesting that higher (riskier) tax avoidance results in lower future pre-tax cash flow levels. Moreover, the path coefficient between the pre-tax cash flow level and loan spreads, $\propto_3$, is negative and significant. The total mediated path, $\beta_2 * \propto_3$, is negative for the two cash ETR measures and positive for *CV_CETR5*. The percentage of the total path explained by the mediating variable, pre-tax cash flows level, is 6%, 11%, and 7% for *CETR5*, *TA_CASH5*, and *CV_CETR5*, respectively.

Panel B of Table 5 reports results for future pre-tax cash flows volatility as a mediating factor. Consistent with Panel A, the direct path between loan spreads and tax avoidance, $\propto_{2,}$ is still significant. When we look at the components of the mediated path, the indirect path coefficient between future pre-tax cash flows volatility and the two cash ETR measures, (*CV_ETR5*) and $\beta_{2,}$ is significantly negative (positive). As expected, the path coefficient between pre-tax cash flow volatility and loan spreads, $\propto_3$, is positive and significant. The total mediated path, $\beta_2 * \propto_3$, is negative for the two cash ETR measures and positive for *CV_CETR5*. The economic magnitude of the mediated path, however, is relatively small, as evidenced by the very low percentage of the total path explained by the mediating variable, pre-tax cash flow volatility, of less than 3% for each of the tax avoidance measures.

Finally, Panel C of Table 5 examines the role of future information quality as the mediating factor. Consistent with Panels A and B, the direct path between loan spreads and tax avoidance, $\propto_2$, is still statistically significant. When we look at the components of the mediated path, the path between the two ETR proxies and information quality, β_2, is significantly negative and for *CV_CETR5* is significantly positive. As expected, the path between information quality and loan spreads, $\propto_{3,}$ is positive and significant. The economic magnitude of the mediated path, however, is relatively small, as evidenced by the low percentage of the total path explained by the mediating variable, information quality, of 8%, 11%, and 20% for *CETR5*, *TA_CASH5*, and *CV_CETR5*, respectively.

4.3. Path analysis discussion

We draw several insights from the path analysis. First, the results indicate that there is a statistically significant direct path between tax avoidance and both bond offering yields and bank loan spreads, regardless of the mediating factor we employ. In other words, the path is not fully mediated, suggesting that other potential unidentified mediating paths may exist.

Second, we document a significant difference in the magnitude of the indirect paths *within* the bond and loan samples. Within the bond sample, we find that for the two cash ETR measures, pre-tax cash flows levels and volatility are relatively more important paths than information quality, while for *CV_CETR5*, information quality is a relatively more important path. Within the bank sample, we find that all three mediating variables explain only a small percentage of the total path, with the information quality path being somewhat more important than the two cash flow paths. A potential explanation for this result is the fact that banks rely a lot more on financial information when contracting with borrowers (e.g., they demand financial covenants and loan performance pricing that is a function of an accounting ratio).

Third, there is a difference in the magnitude of the indirect paths *between* the bond and the loan samples. Future cash flows level and volatility, as well as information quality, matter more as mediating variables in the bond sample as compared to the loan sample. This is consistent with the idea that, relative to bond investors, banks rely less on public information when pricing the debt, presumably because they have access to borrowers' private information. When we examine why channels are less important for the loan sample as compared to the bond sample, we find that, for the information quality channel, the difference in the indirect impact comes mainly from the $\propto_3$ coefficient being much lower in the bank sample than the bond sample, further supporting the idea that banks are less likely to use public information to price debt.

On the other hand, for the future cash flows level and volatility channels, both the path coefficients, $\propto_3$ and β_2, are higher in the bond sample as compared to the loan sample. It is important to highlight that tax avoidance predicts lower levels and higher volatile future pre-tax cash flows in the bond sample, and therefore debt costs are much more sensitive to these channels in the bond sample. This does not mean that banks are not concerned about future cash flows issues. It means, rather, that banks have alternative sources of information about

lenders' future cash flows, and hence are less likely to take into account public signals, here related to tax avoidance, about future cash flows. Bank loans contracts are more likely to include financial covenants, which lead to increased monitoring and frequent loan renegotiations that facilitate access to additional private information about borrowers (see Roberts 2015). Furthermore, bank debt is often collateralized with borrowers' assets, while bonds are not. Given the protection offered by the presence of collateral and covenants, banks might not rely as much on future cash flows when pricing the debt as bond investors do.

To further explore banks' information needs and monitoring intensity, in unreported results, we partition our bank loan sample into two subsamples at the median level of number of loan covenants and run our path analyses separately for high versus low covenant package samples. We argue that banks have higher information needs and monitor more intensely when the loan package includes more covenants. These analyses reveal two key results: First, we find that the direct path is lower and mostly insignificant when the loan contract includes above the median number of covenants. This result suggests that when banks increase monitoring intensity, loan spreads are *less* sensitive to tax avoidance and its future potential negative effects. Second, the magnitude of the indirect path is smaller when the loan contract includes above the median number of covenants. This reinforces the argument that banks have alternative channels to access borrowers' private information (e.g., via loan covenant renegotiations), and hence are less likely to use public information to price loans.

5. Cross-sectional analyses for bond and bank loan samples

In the previous set of analyses, we show that corporate tax avoidance activities are negatively associated with bond offering yields mainly, but not bank loan spreads, due to the negative consequences of these activities on future cash flows. In this section, we investigate whether the negative association is increasing with ex ante proxies for rent extraction and tax

risk. Specifically, we partition our bond and loan samples based on variables that capture incentives for lender wealth expropriation (presence of antitakeover provisions, presence of large blockholders, high risk-taking incentives for management, and high credit risk) and tax risk (the probability of an IRS audit). We then test for differences in the relation between tax avoidance and bond offering yields and bank loan spreads. Results for the bond sample are reported in Table 6 and for the bank loan sample in Table 7.

5.1. Lender wealth expropriation

We use Gompers et al. (2003) antitakeover G-Index as our first proxy for wealth expropriation because it provides an indication of the extent to which the management of the company is protected from the corporate takeover market. We split each sample into two groups according to the median G-Index every year. Observations that have higher (lower) than median G-Index scores are characterized by lower (greater) management monitoring by the takeover market. We estimate the empirical specification in Equation (1) separately for high and low G-Index sub-samples.[11] Panel A of Table 6 reports regression results for the high and low governance quality partitions for the bond sample. We find no evidence of an association between our proxies of tax avoidance and bond offering yields in the high monitoring (high governance) group.

However, we find a significant negative association between our proxies of tax avoidance and bond offering yields for the low monitoring group, suggesting that the results in Table 2 are generally driven by the low monitoring group. In terms of economic magnitude for the low monitoring group, the coefficients indicate an 18-basis-points effect for the two cash ETR measures and a 15-basis-points effect for *CV_CETR5*, for a one standard deviation change in the tax avoidance measures. Results for the bank loan sample are reported in Panel A, Table

[11] We follow this empirical strategy instead of interacting tax avoidance proxies with the indicator for greater management monitoring captured by a low G-Index to ensure that all control variables vary with this indicator. We could interact all control variables with the G-Index dummy, but this is likely to result in multicollinearity.

7. Our three tax avoidance proxies are significantly associated with loan spreads in both the high and low governance quality partitions, except *CETR5*, which is not significant in the low governance quality subsample. There is no difference on bank loan spreads across the two groups except for the smaller effect of low governance quality using the *CETR5* measure. We conclude that tax avoidance negatively impacts the cost of public debt but not the cost of bank loans for firms characterized by poor management monitoring; these firms are more likely to expropriate wealth from bondholders and report lower future cash flows.

Our second proxy for lender wealth expropriation is the presence of large blockholders. We split the bond and loan samples into two groups based on the extent to which blockholders own shares in the company.[12] Observations with a higher (lower) than the median ownership of blockholders are classified as having high (low) ownership concentration. We expect that the association between bond yields/bank loan spreads and tax avoidance is stronger when firms have a higher ownership by blockholders, if these shareholders are opportunistic.

Table 6, Panel B documents that our results in Table 2 are generally driven by firms with high blockholder ownership, suggesting that bondholders view corporate tax avoidance activities negatively only when the firm has concentrated ownership, presumably because they think that money saved through tax avoidance activities might be expropriated by large shareholders. In the bank loan sample, Table 7, panel B, our three tax avoidance proxies are significantly associated with bank loan spreads in both the high and low ownership concentration partitions. The loan spread-tax avoidance relation is significantly different only for the *TA_CASH5* tax avoidance measure, where it is more negative in the low ownership concentration partition. Our results suggest that bondholders are more concerned about blockholder rent expropriation than bank lenders.

[12] We obtain institutional investment data from Thomson Reuters 13f files.

Our third proxy for lender wealth expropriation is the presence of high equity incentives. We thus examine the relationship between tax avoidance and bond yields/loan spreads as a function of managerial equity risk incentives. As we discussed in Section 2.3, if equity risk incentives motivate managers to make risky investing and financing decisions to increase the value of their stock option portfolios, we expect the results to be more pronounced for firms with high managerial equity incentives. Our proxy for managerial equity incentives is CEO vega, measured as sensitivity of a CEO's stock option portfolio to a given change in stock return volatility (Guay 1999). We obtain CEO vega data for the period 1993-2007. We partition our samples into firms with low versus high equity risk incentives at the median of CEO vega in every year; those above the median are referred to as high equity risk incentives.

The bond sample results are reported in Panel C of Table 6. We find that tax avoidance negatively impacts the bond debt yields in both low and high equity risk incentives groups. The results are significantly more pronounced in the high equity risk incentives group for the two cash ETR measures. Within the bank sample reported in Panel C of Table 7, loan spreads are not generally associated with tax avoidance in the low equity risk incentives partition, but are significant in the high risk incentives partition, with the difference being significant for all three tax avoidance measures. These results suggest that both bondholders and banks demand price-protection for firms with high equity risk incentives.

Finally, our last proxy for lender wealth expropriation is the borrower's credit quality. We investigate how the credit quality of the firm, proxied by the magnitude of its bond rating or loan credit rating, impacts the relationship between tax avoidance and the bond yields/loan spreads. Speculative grade bonds (loans) are more likely to go into default, causing large losses for bondholders (bank lenders); thus their equity holders have greater incentives to engage in asset substitution and wealth expropriation to increase the value of their claims. Therefore, we expect our results to be stronger for firms with speculative grade bonds and loans. A bond

(loan) is deemed to be investment grade (speculative grade) bond (loan) if its rating is BBB+ or better (lower than BBB+).

Our results for the bond sample are reported in Panel D of Table 6. Consistent with our expectation, we find that tax avoidance negatively impacts cost of bond debt in both investment and speculative grade bond groups. However, results are significantly stronger in the speculative grade bond group for all three tax avoidance measures. In the bank loan sample as reported in Panel D of Table 7, *CETR5* is not significant within either partition, *TA_CASH5* is significantly more negative in the speculative grade partition, and while *CV_CETR5* is significant in the investment grade partition, there is no difference across the two partitions. Thus, bondholders appear more concerned than bank lenders about tax avoidance when firms have lower credit quality.

5.2 IRS audit probability

In the last set of tests, we investigate the relationship between tax avoidance and bond yields/bank loan spreads as a function of the IRS face-to-face audit probability. Lenders may perceive the IRS as a monitor that reduces agency costs or as increasing the tax risk due to penalties. We utilize information from Syracuse University's Transactional Records Access Clearinghouse (TRAC) system to test the impact of the audit probability. This database provides the percentage of audited tax returns as a function of firm size in the period 1992-2007. We partition our samples into firms with low versus high ex ante audit probability relative to the median of IRS audit probability – those above the median are referred to as high IRS audit probability.

In Table 6, Panel E, we find that corporate tax avoidance negatively impacts the bond yields generally in the sub-sample of bonds with high IRS audit probability, with significant differences for the two cash ETR measures. Somewhat surprisingly for the bank sample as reported in Panel E of Table 7, tax avoidance has larger effects in the low IRS audit probability

partition at least for the two cash ETR measures, but the differences are not significant across the two partitions for all three tax avoidance measures. Overall, the results suggest that bondholders perceive the IRS as an institution that increases tax risk, presumably by penalizing firms that avoid paying taxes.[13]

6. Conclusion

Public debt (or bond debt) and bank loans are prominent in the capital structure of firms, with issuances in the debt market being significantly larger than in the equity market. Therefore, investigating the determinants of the cost of bonds and bank loans is critical in enhancing our understanding of the firm's capital structure and overall cost of capital. While the prior literature documents that bond yields and bank loan spreads are increasing in tax avoidance (Hasan et al. 2014), it does not shed light on the mechanism that drives this relationship.

We document that firms engaging in corporate tax avoidance activities experience significantly lower future pre-tax cash flow levels, greater future pre-tax cash flow volatility, and, to a lesser extent, lower information quality. We use a path analysis to estimate the magnitude of the effects of these three channels through which tax avoidance impacts bond offering yields and bank loan spreads. For the bond sample, we find that corporate tax avoidance has both direct and indirect effects on bond offering yields, with the main indirect effect arising through lower future pre-tax cash flow levels and higher future pre-tax cash flow volatility. Information quality appears to have small, indirect effects. For the bank loan sample, we find that our three mediating (path) variables, future cash flow levels, cash volatility, and

[13] Banks have access to private information about borrowers through private communications. These communications take place given banks' other relationships with the borrowers (treasury, advisory, prior lending), and also because loan contracts are often renegotiated (see Roberts, 2015). Therefore, banks may not need a public signal about the probability of IRS audit when pricing the loans. Please note that when the probability of IRS audit is high, the borrower will not necessarily be subject to an IRS audit. Similarly, if the IRS audit probability is low, it does not mean that the borrower will be exempt from an IRS audit. Banks' private information about a borrower can help them identify whether a borrower will be subject to an IRS audit with a greater precision both in low and high IRS audit probability samples. Hence, the public signal of IRS audit probability (prior audit probability based on year and firm size) might not be very useful and timely.

information quality, have little effect. Additional cross-sectional analyses indicate that tax avoidance only increases the cost of bonds, but not bank loans, when firms' management has incentives to expropriate creditors' wealth and when the probability of an IRS audit is high. These cross-sectional results suggest that banks can mitigate information asymmetry more effectively, given their access to borrowers' private information and their close monitoring activities.

Our research contributes to the emerging stream of literature that examines how lenders view corporate tax avoidance activities. Our results suggest that the impact of tax avoidance on bond offering yields (but not bank spreads) is mediated by future cash flows concerns as opposed to information quality.

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Appendix 1: Control variables

We control for a number of bond-specific characteristics in our regression of tax avoidance on bond yields. We include U.S. Treasury bill rates (*T-bill rate*) to control for shifts in benchmark interest rates and the time preference for money. *Rating* measures the credit quality of the bond issue as assessed by one of the three main certified rating agencies (i.e., Standard and Poors, Fitch, or Moody's).[14] *Life* is the maturity of the bond in years. *Amount of issue* is the total dollar face value of the bond issue. *Subordinated* is an indicator variable that takes the value 1 if the bond is subordinated to other debt securities and 0 otherwise. *Callable* is an indicator variable that takes the value 1 if the bond is callable and 0 otherwise. *Putable* is an indicator variable that takes the value 1 if the bond is putable and 0 otherwise. *Sinkingfund* is an indicator variable that takes the value 1 if a sinking fund exists and 0 otherwise.

Besides *Rating*, *Life*, and *Amount of issue* as defined above, we control for a long list of loan-specific factors in our loan analyses. *Performance pricing* is an indicator variable equal to 1 if the loan includes a performance pricing provision and 0 otherwise. *Debt repayment purpose* is an indicator variable equal to 1 if the loan was taken to repay existing debt and 0 otherwise. *Investment purpose* is an indicator variable equal to 1 if the loan was taken to invest for corporate purposes and 0 otherwise. *Working capital purpose* is an indicator variable equal to 1 if the loan was taken to finance working capital needs and 0 otherwise. *Financial covenants* is the number of financial-based covenants in the loan contract. *General covenants* is the number of general covenants in the loan contract. *Number of lenders* is the number of individual banks that participate in the loan syndicate. *Revolver* is an indicator variable equal to 1 if the loan is revolving and 0 otherwise. *Term mix* is the percentage of individual loans in the loan package with a specified repayment schedule and maturity. *Senior* is an indicator variable equal to 1 if the loan is senior and 0 otherwise. *Secure* is an indicator variable equal to 1 if the loan is secured and 0 otherwise.

We also control for several firm-specific characteristics that are measured in the fiscal year immediately prior to a given bond/loan's issuance. We use *Market to book*, as measured by the firm's market-to-book ratio at the end of the fiscal year prior to the issuance of a debt instrument, to capture firm growth opportunities. *Return on asset* is pretax income before extraordinary items, scaled by total assets at the end of the fiscal year prior to debt issuance. *Leverage* is the sum of the firm's debt in current liabilities and long-term liabilities, scaled by total

[14] As discussed earlier, Crabtree and Maher (2009) and Ayers et al. (2010) show that credit ratings are a function of book-tax differences. Thus, by including credit ratings, we are documenting that the association between bond issuance yields and tax avoidance is incremental to the effect of tax avoidance effects on bond yields via credit ratings.

assets at the end of the fiscal year prior to debt issuance. *Log(Assets)* is the natural logarithm of the firm's total assets at the end of the fiscal year prior to the issuance of a debt instrument. Finally, we include the coefficient of variation of the firm's net operating pre-tax cash flows (scaled by total assets) calculated over the five years prior to debt issuance, *CV_Pre-tax cash flows.*

Finally, we also control for firm characteristics that prior literature suggests are correlated with our tax avoidance measures to ensure that our results are incremental to these factors that might drive fundamental differences in our sample firms (e.g., Mills 1998; Manzon and Plesko 2002; Rego 2003; Dyreng et al. 2008, Frank et al. 2009). *Loss carry forward* is an indicator variable taking the value of 1 if the loss carry forward is positive and 0 otherwise, while *Change in loss carry forward* is change in the loss carry forward scaled by lagged assets. Loss carry forwards could be used to reduce future tax payments and can be positively viewed by debtholders. *Foreign income* is foreign income scaled by lagged assets. *PPE* is property, plant, and equipment scaled by lagged assets. *Intangible assets* is intangible assets scaled by lagged assets. *Equity income* is income in earnings from investments accounted using the equity method scaled by lagged assets.[15]

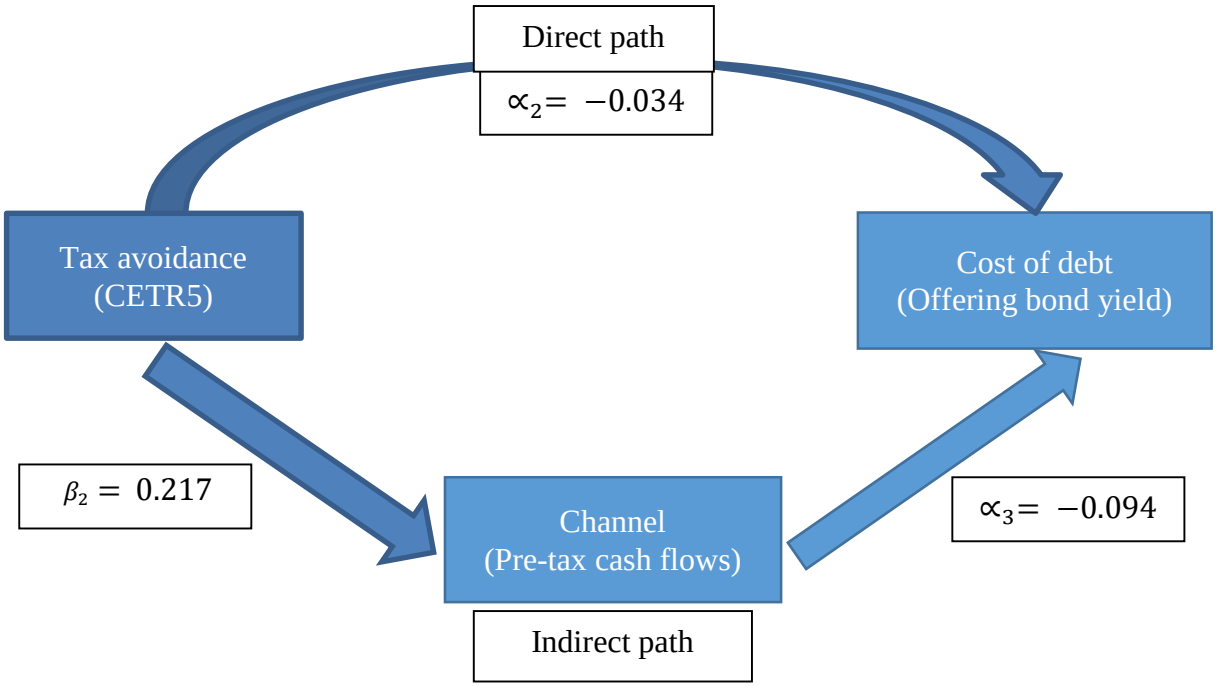
[15] We do not include information quality in the regression, as this variable is a path through which tax avoidance is hypothesized to affect bond yields. Omission of a path variable (also known as a mediating variable) does not lead to a correlated omitted variables problem. We analyze this path below. See Zhao et al. (2010) for further discussion.

Appendix 2: Path analysis example

Tables 4 and 5 document results from path analyses in equations (3) and (4) that examine the effect of corporate tax avoidance on cost of debt directly and through three channels (i.e., cash flows level, cash flows volatility, and information quality). We include one example below (first column of Table 4 Panel A) to show how to interpret the path analyses coefficients.

$$Cost\ of\ debt_{i,t} = \propto_1 + \propto_2 Tax\ avoidance_{i,t-1} + \propto_3 Channel_{i,t\ to\ t+4} + \propto_4 Bond\ specific\ controls_{i,t} + \propto_5 Firm\ specific\ controls_{i,t-1} + \propto_6 Industry\ FE + \propto_7 Year\ FE + \varepsilon_{i,t} \quad (3)$$

$$Channel_{i,t\ to\ t+4} = \beta_1 + \beta_2 Tax\ avoidance_{i,t-1} + \epsilon_{i,t\ to\ t+4} \quad (4)$$



Total mediated (indirect) path ($\beta_2 * \propto_3$) $= -0.020$
Total path ($\beta_2 * \propto_3 + \propto_2$) $= -0.054$
Mediated path/Total path % = 37%

Table 1: Descriptive statistics

CETR5 is cash effective tax rate averaged over the last five years. *TA_CASH5* is CETR5 minus the firm's mean year-industry-size CETR5. *CV_CETR5* is coefficient of variation of cash effective tax rate over the last five years.

Offering bond yield is the bond's percentage yield to maturity at issuance. *T-bill rate* is the percentage matched T-bill rate. *Rating* is the numerical credit rating of the bond issue, where lower values mean higher credit quality. We use *Rating* orthogonalized to all other variables in the empirical analyses. The *Life* is the bond's maturity in years. The *Amount of issue* is the total dollar face value of the bond issue. *Subordinated* is an indicator variable equal to 1 if the bond is subordinated to other debt securities and 0 otherwise. *Callable* is an indicator variable equal to 1 if the bond is callable and 0 otherwise. *Putable* is an indicator variable equal to 1 if the bond is putable and 0 otherwise. *Sinkingfund* is an indicator variable equal to 1 if the bond has a sinking fund feature and 0 otherwise.

Market to book is the firm's market-to-book ratio at the end of the fiscal year prior to bond issuance. *Return on asset* is pretax income before special items, scaled by total assets at the end of the fiscal year prior to bond issuance. *Leverage* is the sum of the firm's debt in current liabilities and long-term liabilities, scaled by total assets at the end of the fiscal year prior to bond issuance. *Assets* is the firm's total assets at the end of the fiscal year prior to bond issuance. The *CV_Pre-tax cash flows* is the coefficient of variation of net operating cash flows before tax payments (obtained from the cash flow statement), scaled by total assets and calculated over the five fiscal years immediately prior to bond issuance. *Loss carry forward* is an indicator variable taking the value of 1 if loss carry forward is positive and 0 otherwise. *Change in loss carry forward* is change in loss carry forward scaled by lagged assets. *Foreign income* is foreign income scaled by lagged assets. *PPE* is property, plant, and equipment scaled by lagged assets. *Intangible assets* is intangible assets scaled by lagged assets. *Equity income* is equity income in earnings scaled by lagged assets.

Loan spread is loan spread quoted in basis points over a floating benchmark, multiplied by 100. *Rating* is numerical credit rating of the loan issue where lower values represent higher credit quality. We use *Rating* orthogonalized to all other variables in the empirical analyses. *Life* is loan maturity in years. *Amount of issue* is total dollar face value of the loan issue. *Performance pricing* is an indicator variable equal to 1 if the loan has performance pricing provision and 0 otherwise. *Debt repayment purpose* is an indicator variable equal to 1 if the loan is taken to repay existing debt and 0 otherwise. *Investment purpose* is an indicator variable equal to 1 if the loan is taken for corporate investment purposes and 0 otherwise. *Working capital purpose* is an indicator variable equal to 1 if the loan is taken to finance working capital needs and 0 otherwise. *Financial covenants* is the number of financial covenants in the loan contract. *General covenants* is the number of general covenants in the loan contract. *Number of lenders* is the number of individual banks that participate in the loan. *Revolver* is an indicator variable equal to 1 if the loan is revolving and 0 otherwise. *Term mix* is the percentage of individual loans in the loan package with a specified repayment schedule and maturity. *Senior* is an indicator variable equal to 1 if the loan is senior and 0 otherwise. *Secure* is an indicator variable equal to 1 if the loan is secured and 0 otherwise.

The sample period is between 1990 and 2007. All non-indicator variables are winsorized at the top and bottom one percentiles. There are 7,945 (6,015) observations in the bond (loan) sample. $^{+++}$, $^{++}$, and $^{+}$ indicate that the means (medians) between bond and loan samples are significantly different at the 1%, 5%, and 10% levels, respectively, in two-tailed t-tests (Wilcoxon rank-sum tests).

Table 1: Descriptive statistics (cont.)

	Bond Sample		Loan Sample	
	Mean	Median	Mean	Median
Tax avoidance proxies				
CETR5	0.245	0.247	0.261^{+++}	0.266^{+++}
TA_CASH5	-0.022	-0.019	-0.008^{+++}	-0.005^{+++}
CV_CETR5	0.523	0.336	0.667^{+++}	0.423^{+++}
Firm characteristics				
Market to book	3.050	2.132	3.239^{+++}	2.259
Return on asset	0.100	0.082	0.113^{+++}	0.096^{+++}
Leverage	0.411	0.373	0.404	0.350^{+++}
Assets (in millions)	12,022	6,523	$4{,}946^{+++}$	$1{,}897^{+++}$
CV_Pre-tax cash flows	0.317	0.203	0.511^{+++}	0.286^{+++}
Loss carry forward	0.161	0.000	0.241^{+++}	0.000^{+++}
Change in loss carry forward	0.001	0.000	0.001^{+++}	0.000
Foreign income	0.014	0.000	0.015^{++}	0.000
PPE	0.568	0.587	0.444^{+++}	0.363^{+++}
Intangible assets	0.113	0.022	0.199^{+++}	0.104^{+++}
Equity income	0.002	0.000	0.001^{+++}	0.000^{+++}
Bond and loan characteristics				
Offering bond yield	7.160	7.098		
Loan spread			4.511	4.471
T-bill rate	5.903	6.000		
Rating	8.083	8.000	9.871^{++}	10.000^{++}
Life	11.841	10.000	3.898^{+++}	4.925^{+++}
Amount of issue (in millions)	179	100	424^{+++}	250^{+++}
Subordinated	0.039	0.000		
Callable	0.489	1.000		
Putable	0.018	0.000		
Sinkingfund	0.029	0.000		
Performance pricing			0.480	0.000
Debt repayment purpose			0.166	0.000
Investment purpose			0.176	0.000
Working capital purpose			0.406	0.000
Financial covenants			1.344	1.000
General covenants			2.528	2.000
Number of lenders			11.403	9.000
Revolver			0.742	1.000
Term mix			0.220	0.000
Senior			0.948	1.000
Secure			0.310	0.000

Table 2: Multivariate analyses for the bonds and loans sample

This table reports the results from OLS estimation models that examine the effect of corporate tax avoidance on bond-offering yields (Panel A) and loan spreads (Panel B). The sample period is between 1990 and 2007. All non-indicator variables are winsorized at the top and bottom one percentiles. The *t*-values, reported in parentheses, are based on standard errors clustered at the firm level. Industry-fixed effects are defined according to Fama and French 48 industry definitions. Variables are defined in Table 2.

Panel A: Bonds sample

	1	2	3
Tax avoidance measures			
CETR5	−0.567		
	(−3.30)		
TA_CASH5		−0.618	
		(−3.22)	
CV_CETR5			0.143
			(4.80)
Bond-specific controls	Yes	Yes	Yes
Firm-specific controls	Yes	Yes	Yes
Year-fixed effects	Yes	Yes	Yes
Industry-fixed effects	Yes	Yes	Yes
N	7,945	7,945	7,945
Adj. R^2	0.787	0.787	0.786

Panel B: Loans sample

	1	2	3
Tax avoidance measures			
CETR5	−0.180		
	(−2.25)		
TA_CASH5		−0.219	
		(−2.60)	
CV_CETR5			0.040
			(4.43)
Loan-specific controls	Yes	Yes	Yes
Firm-specific controls	Yes	Yes	Yes
Year-fixed effects	Yes	Yes	Yes
Industry-fixed effects	Yes	Yes	Yes
N	6,015	6,015	6,015
Adj. R^2	0.778	0.778	0.778

Table 3: The impact of tax avoidance on future cash flows level, volatility, and information quality

This table reports the results from OLS estimation models that examine the effect of corporate tax avoidance on future cash flows level, volatility, and information quality. The dependent variable in columns 1-3 is the average of cash flows from operations scaled by total assets over the next five years. The dependent variable in columns 4-6 is the coefficient of variation of cash flows from operations scaled by total assets over the next five years. The dependent variable in columns 7-9 is the average of composite information quality measure over the next five years. The sample period is between 1990 and 2007. All non-indicator variables are winsorized at the top and bottom onepercentiles. The *t*-values, reported in parentheses, are based on standard errors clustered at the firm level. Industry-fixed effects are defined according to Fama and French 48 industry definitions. Variables are defined in Table 2.

	1	2	3	4	5	6	7	8	9
	Pre-tax cash flows level			**Pre-tax cash flows volatility**			**Information quality**		
Tax avoidance measures									
CETR5	0.063			−0.586			−0.014		
	(8.93)			(−4.27)			(−1.29)		
TA_CASH5		0.066			−0.590			−0.020	
		(8.64)			(−3.99)			(−1.73)	
CV_CETR5			-0.005			0.085			0.010
			(-6.17)			(4.63)			(8.22)
Firm-specific controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	29,159	29,159	29,159	29,159	29,159	29,159	29,159	29,159	29,159
Adj. R^2	0.318	0.318	0.314	0.100	0.099	0.100	0.517	0.517	0.520

Table 4: Bond sample path analysis

This panel reports the results from path analyses in equations (3) and (4) that examine the effect of corporate tax avoidance on bond-offering yields directly and through cash flows level (Panel A), cash flows volatility (Panel B), or information quality (Panel C). p(X1,X2) stands for standardized path coefficient. The sample period is between 1990 and 2007. All non-indicator variables are winsorized at the top and bottom one percentiles. The *t*-values are reported in parentheses. Industry-fixed effects are defined according to Fama and French 48 industry definitions. Variables are defined in Table 2.

$$\begin{aligned} Offering\ bond\ yield_{i,t} &= \propto_1 + \propto_2 Tax\ avoidance_{i,t-1} + \propto_3 Channel_{i,t\ to\ t+4} \\ &+ \propto_4 Bond\ specific\ controls_{i,t} + \propto_5 Firm\ specific\ controls_{i,t-1} \\ &+ \propto_6 Industry\ FE + \propto_7 Year\ FE + \varepsilon_{i,t} \end{aligned} \quad (3)$$

$$Channel_{i,t\ to\ t+4} = \beta_1 + \beta_2\, Tax\ avoidance_{i,t-1} + \epsilon_{i,t\ to\ t+4} \quad (4)$$

Panel A: Pre-tax cash flows level as the mediating variable

	Tax Avoidance Proxy		
	CETR5	**TA_CASH5**	**CV_CETR5**
Direct Path			
p(Tax avoidance, Offering yield) $\propto_2$	−0.034 (−5.12)	−0.029 (−4.44)	0.051 (8.37)
Mediated Path			
p(Tax avoidance, Cash flows level) β_2	0.217 (19.50)	0.331 (31.81)	−0.115 (−9.99)
p(Cash flows level, Offering yield) $\propto_3$	−0.094 (−16.67)	−0.092 (−15.91)	−0.007 (−1.26)
Total mediated path $\beta_2 * \propto_3$	−0.020	−0.031	0.001
Mediated path/Total path % $(\beta_2 * \propto_3)/(\propto_2 + (\beta 2 * \propto_3))$	37%	52%	2%
Bond-specific controls	Yes	Yes	Yes
Firm-specific controls	Yes	Yes	Yes
Year-fixed effects	Yes	Yes	Yes
Industry-fixed effects	Yes	Yes	Yes
N	7,326	7,326	7,326
Equation 4 R^2	0.784	0.786	0.798
Equation 5 R^2	0.047	0.110	0.013

Panel B: Pre-tax cash flows volatility as the mediating variable

	Tax Avoidance Proxy		
	CETR5	**TA_CASH5**	**CV_CETR5**
Direct Path			
p(Tax avoidance, Offering yield) $\propto_2$	−0.031	−0.023	0.051
	(−4.78)	(−3.66)	(8.44)
Mediated Path			
p(Tax avoidance, Cash flows volatility) β_2	−0.137	−0.259	0.065
	(−11.95)	(−23.75)	(5.58)
p(Cash flows volatility, Offering yield) $\propto_3$	0.120	0.119	0.049
	(21.92)	(21.28)	(9.16)
Total mediated path $\beta_2 * \propto_3$	−0.016	−0.031	0.003
Mediated path/Total path % $(\beta_2 * \propto_3)/(\propto_2 + (\beta 2 * \propto_3))$	34%	57%	6%
Bond-specific controls	Yes	Yes	Yes
Firm-specific controls	Yes	Yes	Yes
Year-fixed effects	Yes	Yes	Yes
Industry-fixed effects	Yes	Yes	Yes
N	7,326	7,326	7,326
Equation 4 R^2	0.793	0.794	0.795
Equation 5 R^2	0.019	0.067	0.004

Panel C: Information quality as the mediating variable

	Tax Avoidance Proxy		
	CETR5	**TA_CASH5**	**CV_CETR5**
Direct Path			
p(Tax avoidance, Offering yield) $\propto_2$	−0.047	−0.039	0.052
	(−7.14)	(−6.15)	(8.36)
Mediated Path			
p(Tax avoidance, Information quality) β_2	0.003	−0.085	0.175
	(0.29)	(−7.32)	(15.48)
p(Information quality, Offering yield) $\propto_3$	0.131	0.128	0.076
	(23.54)	(23.05)	(13.92)
Total mediated path $\beta_2 * \propto_3$	0.000	−0.011	0.013
Mediated path/Total path % $(\beta_2 * \propto_3)/(\propto_2 + (\beta 2 * \propto_3))$	0%	22%	20%
Bond-specific controls	Yes	Yes	Yes
Firm-specific controls	Yes	Yes	Yes
Year-fixed effects	Yes	Yes	Yes
Industry-fixed effects	Yes	Yes	Yes
N	7,326	7,326	7,326
Equation 4 R^2	0.783	0.784	0.791
Equation 5 R^2	0.000	0.007	0.031

Table 5: Loan sample path analysis

This panel reports the results from path analyses in equations E4 and E5 that examine the effect of corporate tax avoidance on loan spreads directly and through cash flows level (Panel A), cash flows volatility (Panel B), or information quality (Panel C). p(X1,X2) stands for standardized path coefficient. The sample period is between 1990 and 2007. All non-indicator variables are winsorized at the top and bottom one percentiles. The *t*-values are reported in parentheses. Industry-fixed effects are defined according to Fama and French 48 industry definitions. Variables are defined in Table 2.

$$Loan\ spread_{i,t} = \propto_1 + \propto_2 Tax\ avoidance_{i,t-1} + \propto_3 Channel_{i,t\ to\ t+4} + \propto_4 Bond\ specific\ controls_{i,t} + \propto_5 Firm\ specific\ controls_{i,t-1} + \propto_6 Industry\ FE + \propto_7 Year\ FE + \varepsilon_{i,t} \quad (4)$$

$$Channel_{i,t\ to\ t+4} = \beta_1 + \beta_2 Tax\ avoidance_{i,t-1} + \epsilon_{i,t\ to\ t+4} \quad (5)$$

Panel A: Pre-tax cash flows level as the mediating variable

	Tax Avoidance Proxy		
	CETR5	**TA_CASH5**	**CV_CETR5**
Direct Path			
p(Tax avoidance, Loan spread) $\propto_2$	−0.033 (−4.37)	−0.031 (−4.29)	0.038 (5.27)
Mediated Path			
p(Tax avoidance, Cash flows level) β_2	0.052 (3.77)	0.118 (8.66)	−0.072 (−5.20)
p(Cash flows level, Loan spread) $\propto_3$	−0.036 (−5.33)	−0.035 (−5.26)	−0.035 (−5.20)
Total mediated path $\beta_2 * \propto_3$	−0.002	−0.004	0.003
Mediated path/Total path % $(\beta_2 * \propto_3)/(\propto_2 + (\beta 2 * \propto_3))$	6%	11%	7%
Loan-specific controls	Yes	Yes	Yes
Firm-specific controls	Yes	Yes	Yes
Year-fixed effects	Yes	Yes	Yes
Industry-fixed effects	Yes	Yes	Yes
N	5,214	5,214	5,214
Equation 4 R^2	0.768	0.768	0.769
Equation 5 R^2	0.003	0.014	0.005

Panel B: Pre-tax cash flows volatility as the mediating variable

	Tax Avoidance Proxy		
	CETR5	**TA_CASH5**	**CV_CETR5**
Direct Path			
p(Tax avoidance, Loan spread) $\propto_2$	−0.036 (−4.82)	−0.034 (−4.76)	0.039 (5.34)
Mediated Path			
p(Tax avoidance, Cash flows volatility) β_2	−0.049 (−3.57)	−0.103 (−7.51)	0.054 (3.94)
p(Cash flows volatility, Loan spread) $\propto_3$	0.012 (1.85)	0.012 (1.81)	0.012 (1.76)
Total mediated path $\beta_2 * \propto_3$	−0.001	−0.001	0.001
Mediated path/Total path % $(\beta_2 * \propto_3)/(\propto_2 + (\beta 2 * \propto_3))$	3%	3%	3%
Loan-specific controls	Yes	Yes	Yes
Firm-specific controls	Yes	Yes	Yes
Year-fixed effects	Yes	Yes	Yes
Industry-fixed effects	Yes	Yes	Yes
N	5,214	5,214	5,214
Equation 4 R^2	0.774	0.774	0.771
Equation 5 R^2	0.002	0.011	0.003

Panel C: Information quality as the mediating variable

	Tax Avoidance Proxy		
	CETR5	**TA_CASH5**	**CV_CETR5**
Direct Path			
p(Tax avoidance, Loan spread) $\propto_2$	−0.036 (−4.70)	−0.032 (−4.50)	0.036 (4.83)
Mediated Path			
p(Tax avoidance, Information quality) β_2	−0.056 (−4.06)	−0.075 (−5.43)	0.177 (13.16)
p(Information quality, Loan spread) $\propto_3$	0.051 (7.56)	0.051 (7.57)	0.051 (7.42)
Total mediated path $\beta_2 * \propto_3$	−0.003	−0.004	0.009
Mediated path/Total path % $(\beta_2 * \propto_3)/(\propto_2 + (\beta 2 * \propto_3))$	8%	11%	20%
Loan-specific controls	Yes	Yes	Yes
Firm-specific controls	Yes	Yes	Yes
Year-fixed effects	Yes	Yes	Yes
Industry-fixed effects	Yes	Yes	Yes
N	5,214	5,214	5,214
Equation 4 R^2	0.761	0.768	0.766
Equation 5 R^2	0.004	0.006	0.031

Table 6: Cross-sectional analyses for the bonds sample

Panel A: Multivariate analyses for the bonds sample conditioned on governance quality

This panel reports the results from OLS estimation models that examine the effect of corporate tax avoidance on bond-offering yields. We divided the sample into high and low corporate governance quality by splitting it according to median Gompers, Ishii, and Metrick (G-Index) Index per year. Observations that have higher than median G-Index scores are classified as low corporate governance quality. The sample period is between 1990 and 2007. All non-indicator variables are winsorized at the top and bottom one percentiles. The *t*-values, reported in parentheses, are based on standard errors clustered at the firm level. Industry-fixed effects are defined according to Fama and French 48 industry definitions. Variables are defined in Table 2. $^{+++}$, $^{++}$, and $^{+}$ indicate that the coefficients between high and low governance quality groups are significantly different at the 1%, 5%, and 10% levels, respectively, in two-tailed tests.

	High Governance Quality			*Low Governance Quality*		
Tax avoidance measures						
CETR5	−0.259			−1.477^{++}		
	(−0.77)			(−6.50)		
TA_CASH5		−0.181			−1.661^{+++}	
		(−0.55)			(−6.34)	
CV_CETR5			0.093			0.179^{+++}
			(1.67)			(4.25)
Bond-specific controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm-specific controls	Yes	Yes	Yes	Yes	Yes	Yes
Year-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	2,600	2,600	2,600	2,397	2,397	2,397
Adj. R^2	0.825	0.826	0.823	0.730	0.730	0.730

Panel B: Multivariate analyses for the bonds sample conditioned on ownership concentration

This panel reports the results from OLS estimation models that examine the effect of corporate tax avoidance on bond-offering yields. We divided the sample into high and low ownership concentration by splitting it according to median ownership of block ownership. The sample period is between 1990 and 2007. All non-indicator variables are winsorized at the top and bottom one percentiles. The *t*-values, reported in parentheses, are based on standard errors clustered at the firm level. Industry-fixed effects are defined according to Fama and French 48 industry definitions. Variables are defined in Table 2. $^{+++}$, $^{++}$, and $^{+}$ indicate that the coefficients between high and low ownership concentration groups are significantly different at the 1%, 5%, and 10% levels, respectively, in two-tailed tests.

	Low Ownership Concentration			*High Ownership Concentration*		
Tax avoidance measures						
CETR5	−0.695			−1.231^{++}		
	(−2.75)			(−3.89)		
TA_CASH5		−0.711			−1.422^{+}	
		(−2.84)			(−4.04)	
CV_CETR5			0.105			0.170
			(2.11)			(4.11)
Bond-specific controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm-specific controls	Yes	Yes	Yes	Yes	Yes	Yes
Year-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	3,130	3,130	3,130	3,148	3,148	3,148
Adj. R^2	0.862	0.862	0.861	0.771	0.771	0.779

Panel C: Multivariate analyses for the bonds sample conditioned on equity risk incentives

This panel reports the results from OLS estimation models that examine the effect of corporate tax avoidance on bond-offering yields. We divided the sample into high and low equity risk incentives by splitting it according to the median vega of CEO option portfolio. The sample period is between 1993 and 2007. All non-indicator variables are winsorized at the top and bottom one percentiles. The *t*-values, reported in parentheses, are based on standard errors clustered at the firm level. Industry-fixed effects are defined according to Fama and French 48 industry definitions. Variables are defined in Table 2. $^{+++}$, $^{++}$, and $^{+}$ indicate that the coefficients between high and low equity risk incentives groups are significantly different at the 1%, 5%, and 10% levels, respectively, in two-tailed tests.

	Low Equity Risk Incentives			*High Equity Risk Incentives*		
Tax avoidance measures						
CETR5	−0.589			−0.954^{+}		
	(−2.49)			(−3.54)		
TA_CASH5		−0.524			−1.151^{+++}	
		(−2.03)			(−3.69)	
CV_CETR5			0.165			0.152
			(3.13)			(3.96)
Bond-specific controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm-specific controls	Yes	Yes	Yes	Yes	Yes	Yes
Year-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	2,953	2,953	2,953	2,815	2,815	2,815
Adj. R^2	0.773	0.774	0.773	0.778	0.777	0.777

Panel D: Multivariate analyses for the bonds sample conditioned on bond rating

This panel reports the results from OLS estimation models that examine the effect of corporate tax avoidance on bond-offering yields. A bond is deemed to be investment grade (speculative grade) bond if its rating is BBB+ or better (lower than BBB+). The sample period is between 1990 and 2007. All non-indicator variables are winsorized at the top and bottom one percentiles. The *t*-values, reported in parentheses, are based on standard errors clustered at the firm level. Industry-fixed effects are defined according to Fama and French 48 industry definitions. Variables are defined in Table 2. $^{+++}$, $^{++}$, and $^{+}$ indicate that the coefficients between investment and speculative grade bond groups are significantly different at the 1%, 5%, and 10% levels, respectively, in two-tailed tests.

	Investment grade bond			*Speculative grade bond*		
Tax avoidance measures						
CETR5	−0.387			−1.190^{+++}		
	(−2.06)			(−5.50)		
TA_CASH5		−0.485			−1.777^{++}	
		(−2.37)			(−7.79)	
CV_CETR5			0.089			0.228^{+++}
			(2.77)			(7.49)
Bond-specific controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm-specific controls	Yes	Yes	Yes	Yes	Yes	Yes
Year-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	4,712	4,712	4,712	3,233	3,348	3,348
Adj. R^2	0.872	0.872	0.872	0.775	0.774	0.775

Panel E: Multivariate analyses for the bonds sample conditioned on IRS audit probability

This panel reports the results from OLS estimation models that examine the effect of corporate tax avoidance on bond-offering yields. We divided the sample into high and low IRS audit probability by splitting it according to the median IRS audit probability. IRS audit probability is obtained from Transactional Records Access Clearinghouse (TRAC) website. The sample period is between 1992 and 2007. All non-indicator variables are winsorized at the top and bottom one percentiles. The *t*-values, reported in parentheses, are based on standard errors clustered at the firm level. Industry-fixed effects are defined according to Fama and French 48 industry definitions. Variables are defined in Table 2. $^{+++}$, $^{++}$, and $^{+}$ indicate that the coefficients between high and low IRS audit probability groups are significantly different at the 1%, 5%, and 10% levels, respectively, in two-tailed tests.

	Low IRS Audit Probability			*High IRS Audit Probability*		
Tax avoidance measures						
CETR5	−0.126			−0.911^{+++}		
	(−0.50)			(−4.62)		
TA_CASH5		−0.416			−0.916^{+++}	
		(−1.54)			(−4.02)	
CV_CETR5			0.146			0.161
			(3.68)			(4.77)
Bond-specific controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm-specific controls	Yes	Yes	Yes	Yes	Yes	Yes
Year-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	3,691	3,691	3,691	3,629	3,686	3,686
Adj. R^2	0.776	0.776	0.773	0.774	0.773	0.774

Table 7: Cross-sectional analyses for the loans sample

Panel A: Multivariate analyses for the loans sample conditioned on governance quality

This panel reports the results from OLS estimation models that examine the effect of corporate tax avoidance on loan spreads. We divided the sample into high and low corporate governance quality by splitting it according to the median Gompers, Ishii, and Metrick (G-Index) Index per year. Observations that have higher than median G-Index scores are classified as low corporate governance quality. The sample period is between 1990 and 2007. All non-indicator variables are winsorized at the top and bottom one percentiles. The *t*-values, reported in parentheses, are based on standard errors clustered at the firm level. Industry-fixed effects are defined according to Fama and French 48 industry definitions. Variables are defined in Table 2. $^{+++}$, $^{++}$, and $^{+}$ indicate that the coefficients between high and low governance quality groups are significantly different at the 1%, 5%, and 10% levels, respectively, in two-tailed tests.

	High Governance Quality			*Low Governance Quality*		
Tax avoidance measures						
CETR5	−0.380			−0.217^{+}		
	(−2.71)			(−1.50)		
TA_CASH5		−0.413			−0.277	
		(−2.64)			(−1.91)	
CV_CETR5			0.036			0.041
			(1.95)			(4.25)
Loan-specific controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm-specific controls	Yes	Yes	Yes	Yes	Yes	Yes
Year-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	1,739	1,739	1,739	1,869	1,869	1,869
Adj. R^2	0.801	0.801	0.801	0.769	0.769	0.768

Panel B: Multivariate analyses for the loans sample conditioned on ownership concentration

This panel reports the results from OLS estimation models that examine the effect of corporate tax avoidance on loan spreads. We divided the sample into high and low ownership concentration by splitting it according to the median ownership of block ownership. The sample period is between 1990 and 2007. All non-indicator variables are winsorized at the top and bottom one percentiles. The *t*-values, reported in parentheses, are based on standard errors clustered at the firm level. Industry-fixed effects are defined according to Fama and French 48 industry definitions. Variables are defined in Table 2. $^{+++}$, $^{++}$, and $^{+}$ indicate that the coefficients between high and low ownership concentration groups are significantly different at the 1%, 5%, and 10% levels, respectively, in two-tailed tests.

	Low Ownership Concentration			*High Ownership Concentration*		
Tax avoidance measures						
CETR5	−0.221			−0.226		
	(−1.92)			(−1.99)		
TA_CASH5		−0.313			−0.185^{+}	
		(−2.56)			(−4.04)	
CV_CETR5			0.044			0.050
			(2.71)			(3.66)
Loan-specific controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm-specific controls	Yes	Yes	Yes	Yes	Yes	Yes
Year-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	2,453	2,453	2,453	2,453	2,453	2,453
Adj. R^2	0.792	0.792	0.792	0.780	0.781	0.780

Panel C: Multivariate analyses for the loans sample conditioned on equity risk incentives

This panel reports the results from OLS estimation models that examine the effect of corporate tax avoidance on loan spreads. We divided the sample into high and low equity risk incentives by splitting it according to the median vega of CEO option portfolio. The sample period is between 1993 and 2007. All non-indicator variables are winsorized at the top and bottom one percentiles. The *t*-values, reported in parentheses, are based on standard errors clustered at the firm level. Industry-fixed effects are defined according to Fama and French 48 industry definitions. Variables are defined in Table 2. $^{+++}$, $^{++}$, and $^{+}$ indicate that the coefficients between high and low equity risk incentives groups are significantly different at the 1%, 5%, and 10% levels, respectively, in two-tailed tests.

	Low Equity Risk Incentives			*High Equity Risk Incentives*		
Tax avoidance measures						
CETR5	−0.144			−0.352^{+}		
	(−1.14)			(−2.64)		
TA_CASH5		−0.112			−0.429^{++}	
		(−0.84)			(−3.25)	
CV_CETR5			0.042			0.076^{++}
			(2.83)			(3.57)
Loan-specific controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm-specific controls	Yes	Yes	Yes	Yes	Yes	Yes
Year-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	2,226	2,226	2,226	2,226	2,226	2,226
Adj. R^2	0.786	0.786	0.785	0.776	0.776	0.776

Panel D: Multivariate analyses for the loans sample conditioned on loan rating

This panel reports the results from OLS estimation models that examine the effect of corporate tax avoidance on loan spreads. A loan is deemed to be an investment grade (speculative grade) loan if its rating is BBB+ or better (lower than BBB+). The sample period is between 1990 and 2007. All non-indicator variables are winsorized at the top and bottom one percentiles. The *t*-values, reported in parentheses, are based on standard errors clustered at the firm level. Industry-fixed effects are defined according to Fama and French 48 industry definitions. Variables are defined in Table 2. $^{+++}$, $^{++}$, and $^{+}$ indicate that the coefficients between investment and speculative grade bond groups are significantly different at the 1%, 5%, and 10% levels, respectively, in two-tailed tests.

	Investment grade loan			*Speculative gradeloan*		
Tax avoidance measures						
CETR5	−0.151			−0.203		
	(−1.81)			(−1.11)		
TA_CASH5		−0.144			−0.427^{+++}	
		(−1.65)			(−2.12)	
CV_CETR5			0.039			0.045
			(4.29)			(1.74)
Loan-specific controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm-specific controls	Yes	Yes	Yes	Yes	Yes	Yes
Year-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	4,546	4,546	4,546	1,469	1,469	1,469
Adj. R^2	0.703	0.703	0.703	0.590	0.591	0.590

Panel E: Multivariate analyses for the loans sample conditioned on IRS audit probability

This panel reports the results from OLS estimation models that examine the effect of corporate tax avoidance on loan spreads. We divided the sample into high and low IRS audit probability by splitting it according to the median IRS audit probability. IRS audit probability is obtained from Transactional Records Access Clearinghouse (TRAC) website. The sample period is between 1992 and 2007. All non-indicator variables are winsorized at the top and bottom one percentiles. The *t*-values, reported in parentheses, are based on standard errors clustered at the firm level. Industry-fixed effects are defined according to Fama and French 48 industry definitions. Variables are defined in Table 2. $^{+++}$, $^{++}$, and $^{+}$ indicate that the coefficients between high and low IRS audit probability groups are significantly different at the 1%, 5%, and 10% levels, respectively, in two-tailed tests.

	Low IRS Audit Probability			*High IRS Audit Probability*		
Tax avoidance measures						
CETR5	−0.255			−0.157		
	(−2.62)			(−1.35)		
TA_CASH5		−0.298			−0.156	
		(−2.99)			(−1.21)	
CV_CETR5			0.045			0.045
			(3.92)			(3.24)
Loan-specific controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm-specific controls	Yes	Yes	Yes	Yes	Yes	Yes
Year-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	3,106	3,106	3,106	2,733	2,733	2,733
Adj. R^2	0.823	0.823	0.822	0.774	0.774	0.774